# Introduction

*In 1977,* legislation identified the need and gave direction for the content of this assessment. State law (Public Resource Code 4789) requires the California Department of Forestry and Fire Protection (CDF) to periodically assess California's forest and rangeland resources. The Forest and Rangeland 2003 Assessment is the fourth edition required by this legislation. A central goal of this assessment process is for the California State Board of Forestry and Fire Protection to issue a policy statement based on published analysis and public hearings. The Assessment was conducted by the Fire and Resource Assessment Program (FRAP) during the period of 2000–2003, in cooperation with many external academic, government, and private resource professionals.

## *Assessment Goal:*

To provide the California State Board of Forestry and Fire Protection, the public, and other policy makers information on environmental, economic, and social conditions that support forest and rangeland resource sustainability.

## Geographic Scope

California covers a vast landscape of over 100 million acres, of which over 80 percent are defined as forests and rangelands (Table 3, Figure 10). The geographic scope of forests and rangelands are addressed by statute as those suitable for timber production or grazing by domestic livestock, and other forested lands (Figure 9). The broad land cover classes encompassing forests and rangelands have been identified using the FRAP Multi-Source Land Cover (v02_1) information system (FRAP, 2002c) and include the following:

- Conifer and Hardwood Forests;
- Conifer and Hardwood Woodlands;
- Shrubs;
- Grasslands;
- Desert Shrub and Woodlands; and
- some Wetlands.

**Table 3. Area of land cover classes by major ownership (thousand acres)**

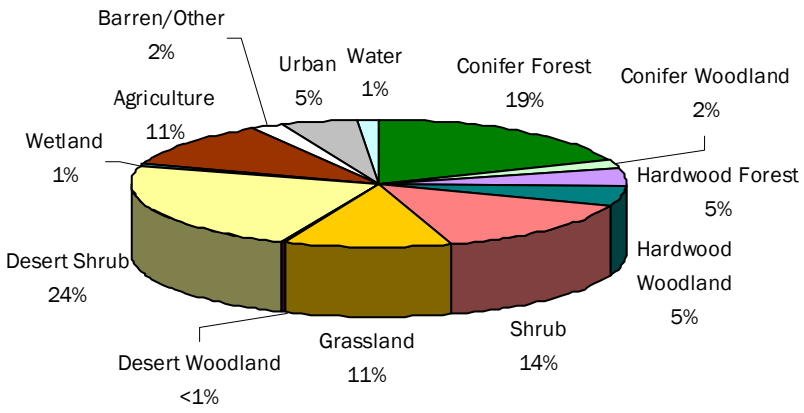
| Land cover class | Private | USFS | BLM | NPS | Other public | Total |
|---|---|---|---|---|---|---|
| Conifer Forest | 6,432 | 10,644 | 394 | 1,108 | 426 | 19,004 |
| Conifer Woodland | 458 | 1,051 | 482 | 220 | 151 | 2,363 |
| Hardwood Forest | 2,901 | 1,287 | 176 | 134 | 193 | 4,691 |
| Hardwood Woodland | 4,292 | 310 | 239 | 36 | 309 | 5,188 |
| Shrub | 5,433 | 5,673 | 2,261 | 319 | 878 | 14,565 |
| Grassland | 9,621 | 233 | 496 | 43 | 526 | 10,919 |
| Desert Woodland | 42 | 3 | 55 | 22 | 12 | 134 |
| Desert Shrub | 4,256 | 197 | 10,198 | 4,656 | 4,106 | 23,414 |
| Wetland (F&R)* | 145 | 69 | 11 | 20 | 23 | 268 |
| Forest and Rangeland Total | 33,582 | 19,468 | 14,312 | 6,558 | 6,626 | 80,545 |
| Wetland (non F&R)* | 189 | (L) | 1 | 2 | 80 | 272 |
| Agriculture | 11,201 | 4 | 42 | (L) | 174 | 11,421 |
| Barren/Other | 229 | 918 | 203 | 680 | 254 | 2,283 |
| Urban | 4,606 | 17 | 29 | 8 | 250 | 4,909 |
| Water** | | | | | | 1,486 |
| Statewide Total | 49,805 | 20,406 | 14,587 | 7,247 | 7,384 | 100,915 |

** Only the Wet Meadow CWHR habitat type is considered forests and rangelands. See Appendix.*
*** Areas classified as water are not assigned an ownership.*
*(L) – less than 500 acres; BLM – U.S. Bureau of Land Management; NPS – National Park Service; USFS – U.S. Forest Service; F&R – forests and rangelands*
*Source: FRAP, 1999; FRAP, 2002d*

**Figure 9. Forests and rangelands of California**


*Source: FRAP, 2002d*

**Figure 10. Percentage area of land cover classes, statewide**



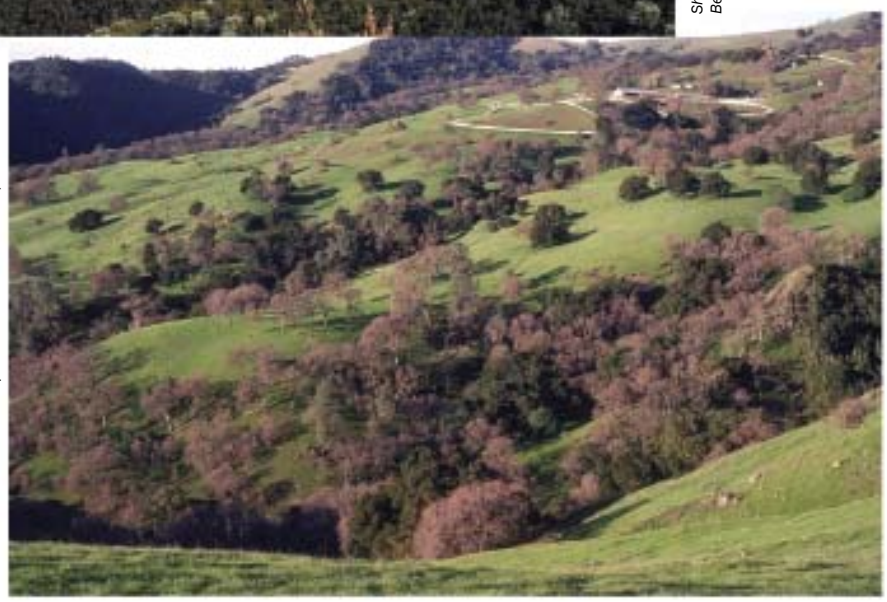

*Source: FRAP, 2002d*

Desert Shrub (Photo: Bureau of Land Management)

Conifer Forest. (Photo: G. Donald Bain, Geo-Images, UC Berkeley.

Shrub lands (Photo: G. Donald Bain, Geo–Images Project, UC Berkeley)

Wet Meadow (Photo: Marc Hoshovsky, Department of Fish and Game)



Hardwood Woodland (Photo: G. Donald Bain, Geo–Images Project, UC Berkeley)

## Regional and County Perspectives

California is a land of great variety and contrasts that defies simple descriptions. This diversity covers many cultural, physical, economic, and biological characteristics. California's size and diversity ensures that statewide averages do not accurately represent diverse localities. To address this diversity, the Assessment provides statewide, regional, and county level information.

For regional perspectives, the Assessment uses various geographic designations called bioregions. The two most commonly used bioregion designations are the California Biodiversity Council (CBC) bioregions (Figure 11) and county-based bioregions. CBC bioregions reflect unique physical and biological characteristics, such as climate, topography, vegetation, and wildlife. In contrast, county-based bioregions follow jurisdictional boundaries and place whole counties in the most representative region. It is in the context of these unique bioregional characteristics that this assessment explores the environmental, economic, and social conditions of forests and rangelands.

**Figure 11. California Biodiversity Council bioregions**


*Source: California Biodiversity Council, 1992; FRAP, 1998*

## Sample landscapes in California's bioregions

Klamath/North Coast (Jackson Demonstration State Forest)

Bay Area/Delta (Ring Mountain Preserve, near Tiburon)

Central Coast (Jalama Creek, near Gaviota)

South Coast (Inland Empire, Lake Elsinore)

Sacramento Valley (Sacramento River at Dunsmuir)

San Joaquin Valley (Tulare County)

*San Joaquin Valley photo courtesy of Gary Kramer, USDA NRCS. All remaining photos courtesy of Geo-Images Project, Department of Geography, University of California, Berkeley*

Modoc (near Tule Lake, Modoc County)

Sierra bioregion (Yosemite Valley)

Mojave (Fort Piute, East Mojave National Scenic Area)

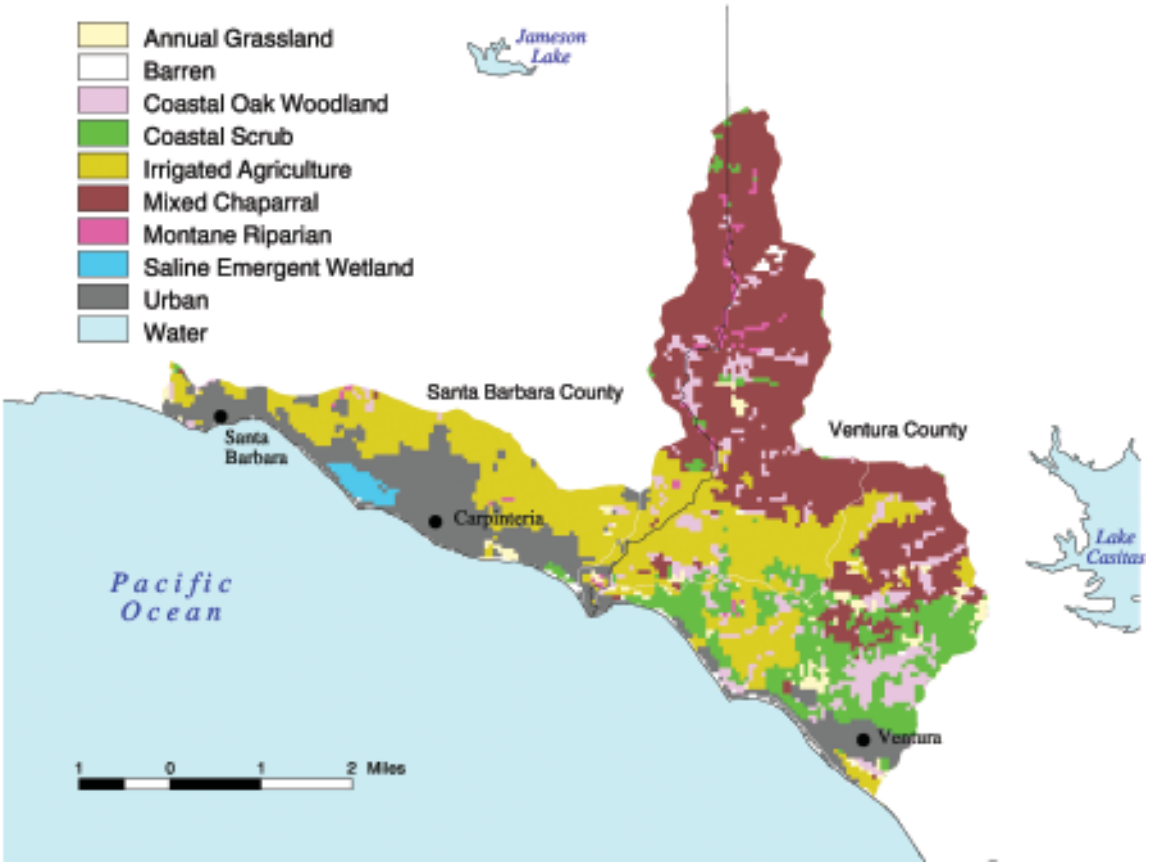
Colorado Desert (Titus Canyon, Death Valley National Monument)

## Integrating Spatial Information at Local Levels

A key feature of the Assessment is the ability to bring together detailed information on natural, economic, and social dimensions at a wide range of spatial scales. FRAP provides detailed, consistent statewide data across all of California's forests and rangelands. This provides decision makers and other stakeholders the ability to use common information applicable to their particular needs at the state, regional, county, and watershed scales.

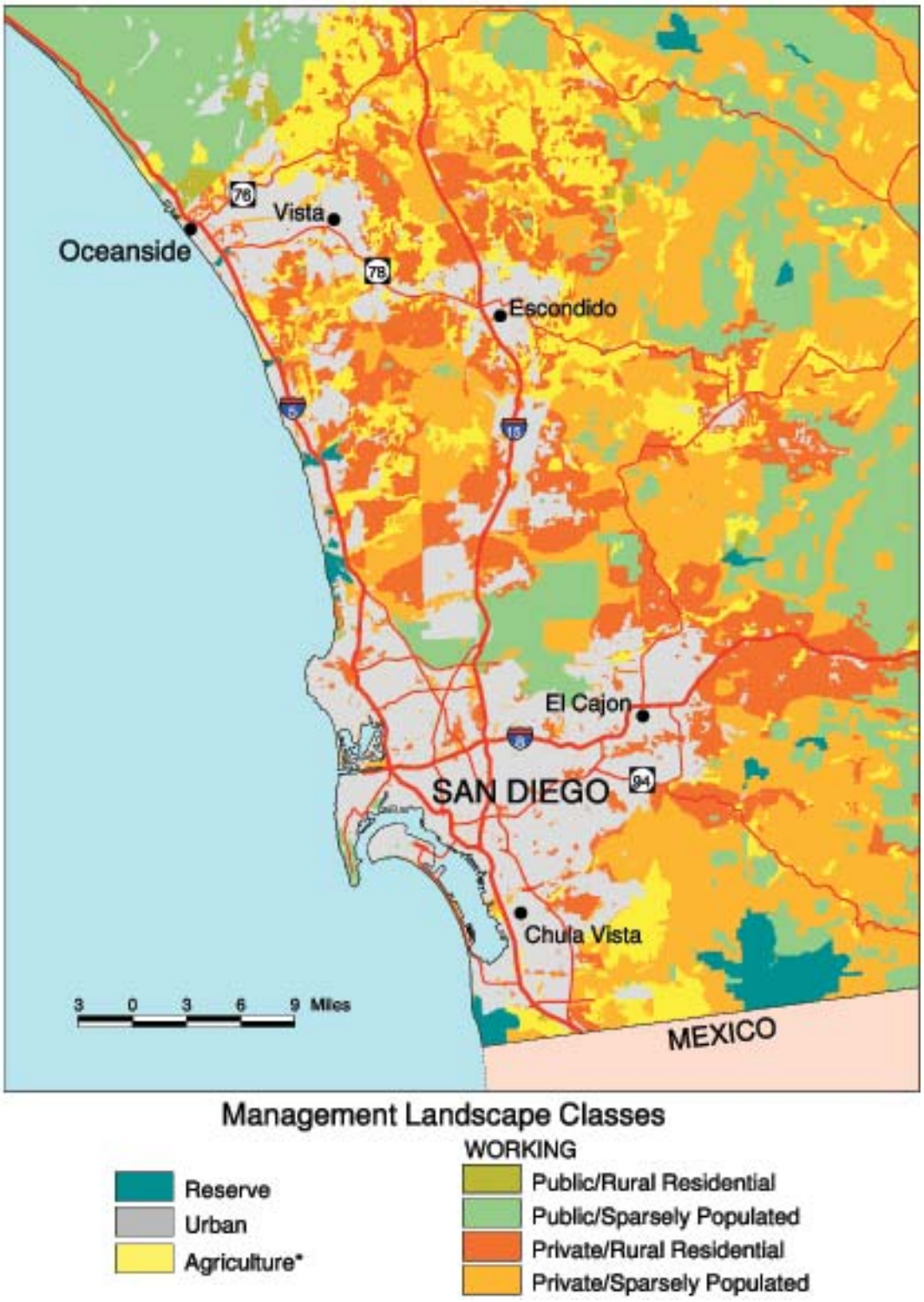
An example of this feature is the data in FRAP's web-based Coastal Watershed Mapping Tool (Figure 12). The figure below illustrates detailed habitat types for Rincon Creek, a small coastal watershed south of Santa Barbara The mapping tool provides information for all watersheds draining to the ocean. When combined with other available data such as rainfall, wildland fuel characteristics, current and projected housing densities, and land uses (Figure 13), decision makers can develop reasonable initial assessments of such issues as potential non-point source pollution from new land uses, fire threats, and residential development.

**Figure 12. California Wildlife Habitat Relationship (CWHR) types, Rincon Creek watershed**




*Source: FRAP, 2002d*

**Figure 13. Management Landscape classes depicting the combination of land use, housing density, and ownership in western San Diego County**




** includes Rural Residential and Sparsely Populated*
*Source: FRAP, 2002b*

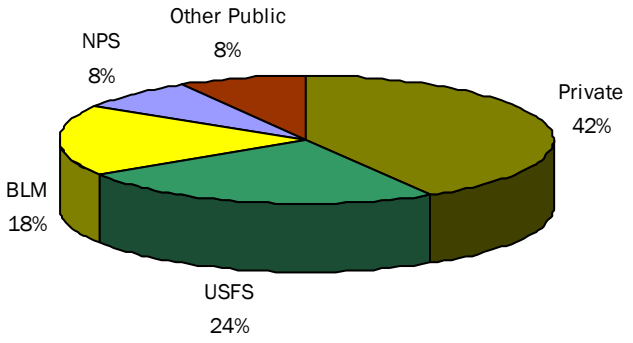
## Ownership

California is a patchwork of public and private land ownership that continues to change with new land acquisitions, trades, and divestments. Half of all land in the State is under public ownership.

Federal agencies such as the U.S. Forest Service (USFS), Bureau of Land Management (BLM), and National Park Service (NPS) have responsibility for the care and management of natural resources on public lands. Additional owners in the Other Public group include local agencies (cities, counties, and water and park districts); state agencies (Department of Fish and Game, State Lands Commission, Department of Forestry and Fire Protection, Department of Parks and Recreation, and other state departments); and other federal agencies (Bureau of Indian Affairs, Bureau of Reclamation, Army Corps of Engineers, Department of Defense, and U.S. Fish and Wildlife Service). The remaining half of California is privately owned by individuals, corporations, or conservancies.

The area of forests and rangelands is also roughly split evenly between private and public ownership, but varies among bioregions (Table 4). Forty-two percent of forests and rangelands is in private ownership while 58 percent is in public ownership (Figure 14, Figure 15).

**Figure 14. Percentage area of forests and rangelands by major ownership**



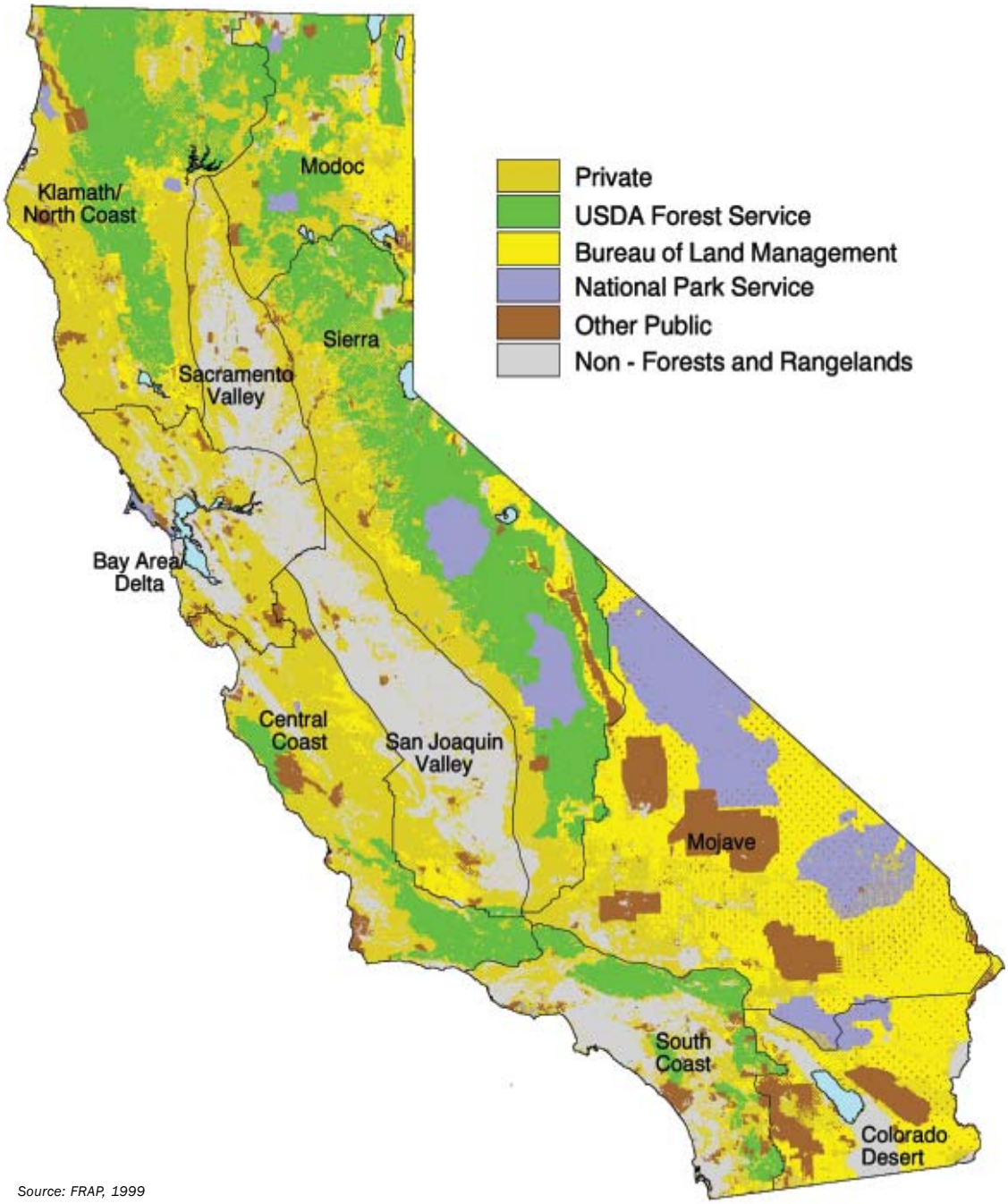

*Source: FRAP, 1999; FRAP, 2002d*

**Table 4. Area of forests and rangelands by major ownership and bioregion (thousand acres)**

| Bioregion | Private | USFS | BLM | NPS | Other Public | Total |
|---|---|---|---|---|---|---|
| Bay Area/Delta | 2,754 | | 48 | 76 | 255 | 3,134 |
| Central Coast | 4,786 | 1,671 | 311 | 15 | 461 | 7,244 |
| Colorado Desert | 1,071 | 9 | 2,696 | 326 | 1,304 | 5,406 |
| Klamath/North Coast | 6,997 | 5,613 | 583 | 117 | 371 | 13,681 |
| Modoc | 2,840 | 2,773 | 1,363 | 140 | 211 | 7,327 |
| Mojave | 3,548 | 84 | 7,692 | 4,709 | 2,885 | 18,918 |
| Sacramento Valley | 1,549 | (L) | 28 | | 70 | 1,648 |
| San Joaquin Valley | 2,219 | 69 | 300 | | 118 | 2,706 |
| Sierra | 5,740 | 7,543 | 1,144 | 1,158 | 487 | 16,072 |
| South Coast | 2,076 | 1,707 | 146 | 18 | 465 | 4,410 |
| Forest and Rangeland Total | 33,582 | 19,468 | 14,312 | 6,558 | 6,626 | 80,545 |
| Statewide Total* | 49,805 | 20,406 | 14,587 | 7,247 | 7,384 | 100,915 |

*(L) less than 500 acres*
** areas classified as water are not assigned an ownership*
*Source: FRAP, 1999; FRAP, 2002d*

**Figure 15. Major ownership of forests and rangelands**




*Source: FRAP, 1999*

## Management Landscape

The Management Landscape is a conceptual framework that describes how land is used and managed. Identifying and understanding the Management Landscape in California is fundamental to addressing the complexities associated with natural resource management and potential impacts.

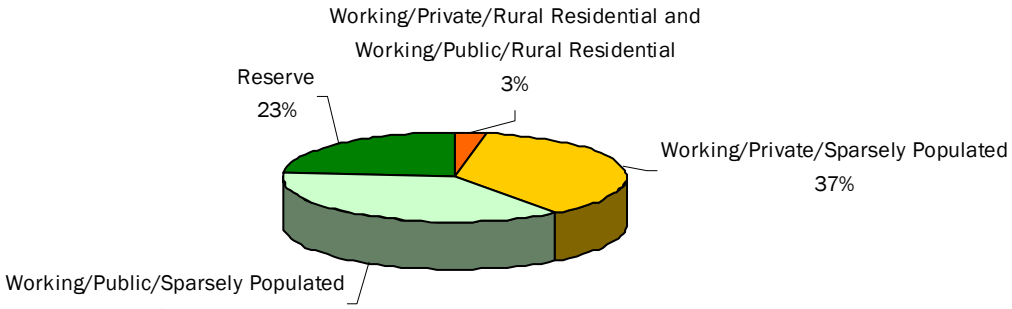
Three major components comprise the Management Landscape of California:

- land use;
- ownership; and
- housing density.

These three components combine into a database than can be represented by a single, although visually complex, map called the Management Landscape (Figure 16 and Appendix). The Management Landscape is the basis for much of the Assessment and contains several management classes including Reserve, Urban, Agriculture, and Working (Table 5). Agriculture and Working are further subdivided by housing density into Rural Residential and Sparsely Populated. Additionally, the Working classes have Public and Private ownership designations.

Lands in the Working management class are managed for a wide range of purposes, often with commodity production as the economic base for ownership and management. Reserve lands are generally managed consistent with statutory designations such as wilderness, wild and scenic, national parks, and national monuments, often with strict limits on management activities. Most of California's forests and rangelands are in the Working/Sparsely Populated (both Public and Private) classifications (74 percent) with nearly all the balance in Reserve (23 percent) (Figure 17).

**Figure 16. Percentage area of forests and rangelands by Management Landscape class**



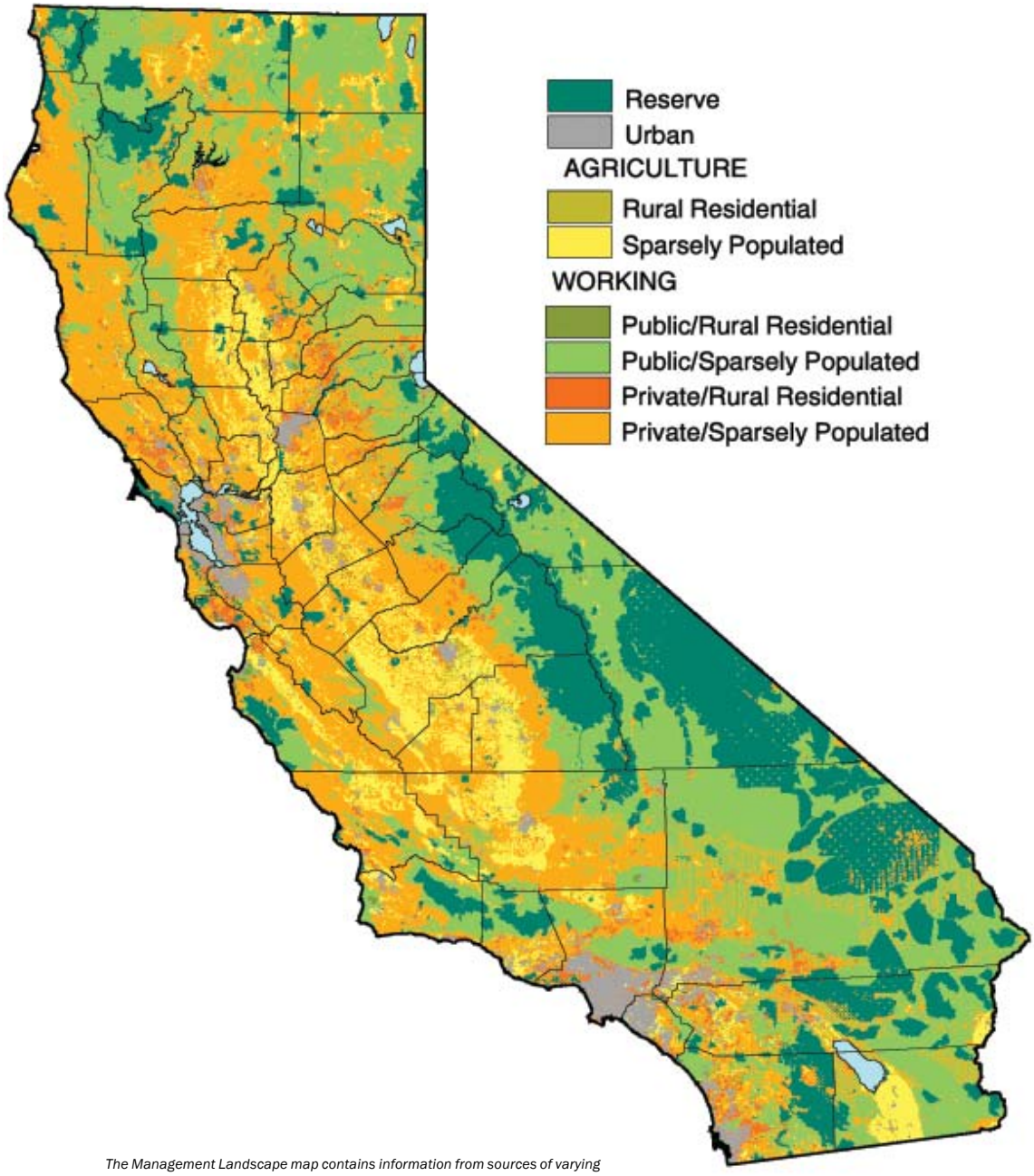

*Source: FRAP, 2002b*

**Table 5. Management Landscape class profile, all land covers, statewide**

| Management classifications | Area (million acres) | Management emphasis |
|---|---|---|
| Reserve | 20 | Consistent with these designations: wilderness, wild and scenic, national parks, national monuments. Commodity production prohibited or greatly restricted. |
| Working/Public/Sparsely Populated | 31 | Lands under public administration with management consistent with agency mandates. Commodity production allowable. Housing density less than 1 unit per 20 acres. |
| Working/Private/Sparsely Populated | 33 | Lands under private ownership with management and commodity production consistent with governmental regulations. Housing density less than 1 unit per 20 acres. |
| Working/Public/Rural Residential | <1 | Lands under public administration with management consistent with agency mandates. Commodity production allowable but more complex due to surrounding people and structures. Housing density of one or more units per 20 acres and less than 1 unit per acre. |
| Working/Private/Rural Residential | 3 | Lands under private ownership with management and commodity production consistent with governmental regulations but more complex due to surrounding people and structures. Housing density of one or more units per 20 acres and less than 1 unit per acre. Often readily available for conversion to more intensive uses. |
| Agriculture/Sparsely Populated | 10 | Fully dedicated to irrigated agriculture. Housing density less than 1 unit per 20 acres. |
| Agriculture/Rural Residential | 1 | Fully dedicated to irrigated agriculture. More complex due to surrounding people and structures. Housing density of one or more units per 20 acres and less than 1 unit per acre. |
| Urban | 3 | Dedicated to high-density residential and commercial uses. Housing density of one or more units per acre. |
| Total | 101 | |

*Source: FRAP, 2002b*

**Figure 17. The Management Landscape of California**




*The Management Landscape map contains information from sources of varying dates. While most data used in the map is circa 1990–1999, some information is from the 1970s.*
*Source: FRAP, 2002b*

## Gateway to Assessment Products

The principal media used for presentation of the 2003 Assessment is the world wide web rather than a large print-based report. Rapid changes in the natural resource arena of California require the ability to broadly and quickly deliver information. Use of the web provides a unique opportunity for this assessment to be a "living document" allowing easier and faster updating of the technical reports, thus keeping them current and relevant. Additionally, the related information links included throughout the on-line assessment documents provide in-depth focus on specific topics. This approach allows users to access the most current information through internet access to spatial data, databases, literature, and external sources of information on topics of interest.

### On-line Technical Reports

These are the complete, expanded evaluations of the environmental, economic, and social conditions and threats to California's forests and rangelands. In-depth narratives, statistics, methodologies, and interpretations are displayed for over 30 topics used to describe forests and rangelands. Information is available on–line and on compact disc (CD). A list of reports is shown on page 33.

### Related Information

Perhaps the most important part of the Assessment is the information created or used by FRAP and made available to users for their specific needs. Four types of related information have been compiled and are available.

- **Data:** Spatial data in the form of Geographic Information Systems (GIS) files, databases, and tables from which users can extract information and develop their own analyses.
- **Maps:** A variety of Assessment-related maps are available including wildlife habitat, management complexity, ownership, wildfire characteristics, and development patterns.
- **Related links:** external links to publications and data authored by various academic, non-profit, and government agencies.
- **Interactive products**: on-line mapping services in which users can display and query spatial information.

### Updated Information

By periodically updating the Assessment products (on-line technical reports and related information), discrepancies may result between the published Assessment Summary and the updated Assessment products. By referring to the Assessment website, the most up-to-date information can be obtained.

**http://www.frap.cdf.ca.gov/assessment2003**

## On-line Technical Reports

***Chapter 1: Conservation of Biological Diversity***

- Habitat Diversity
- Special Habitat Elements: Snags and Down Logs
- Old Growth Forests
- Hardwoods
- Population Status of Native Species
- Species of Concern

***Chapter 2: Maintenance of Productive Capacity***

- Forest Land Base
- Timberland Inventory Characteristics
- Maintenance of Productivity of Forest Lands by Zoning
- Rangeland Area and Condition

***Chapter 3: Maintenance of Forest and Rangeland Health and Vitality***

- Habitat Loss and Alteration
- Wildfire Risks to Assets
- Trends in Wildland Fire
- Forest Pests and Diseases
- Non-native Invasive Species
- Air Quality Influences

***Chapter 4: Soil Conservation and Water Quality***

- Protection of Soil
- Watershed Quality and Assessment

***Chapter 5: Forest Contribution to Global Carbon Cycles***

- Forests and Climate Change

***Chapter 6: Maintenance of Socio-Economic Benefits***

- Socio-Economic Characteristics
- California's Economic Conditions and Structure
- Forest and Range Related Energy Industry
- Recreation
- Range Livestock Industry
- Forest Products Industry
- Water Supply and Use
- Contributions of Timber-Related Revenue to Local Governments

***Chapter 7: Legal, Institutional, and Economic Framework for Forest and Rangeland Conservation and Sustainable Management***

- Legal Frameworks
- Institutional Shifts During the 1990s
- Infrastructure and Services in Support of Forest and Range Communities
- Resource Investments
- California's Wildland Fire Infrastructure
- Information Collection, Monitoring, and Research

## The 2003 Assessment and the Montréal Process

The Forest and Range 2003 Assessment is organized around the emerging worldwide forest management concept of sustainability. It is a common sense concept that resonates with the public. While it has many definitions, the Assessment uses a widely ascribed definition of meeting the needs of the present without comprising the ability of future generations to meet their needs.

To help organize the 2003 Assessment and to provide a common language and framework for evaluating sustainability, FRAP has adopted the seven internationally recognized criteria for conservation and sustainable forest management. These criteria, called the "Montréal Process" are based on discreet measurements, or indicators, that have been adopted internationally beginning with the 1992 Earth Summit, or United Nations Conference on Environment and Development. During subsequent meetings, initiatives were launched among non-European countries with temperate and boreal forests to develop and implement internationally agreed criteria and indicators for sustainable forest management.

The Montréal Process began in June 1994, in Geneva, with the first meeting of the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. The criteria and indicators derived from this process are being used by twelve countries covering over 90 percent of the world's temperate and boreal forests (as well as areas of tropical forests) (Montréal Process Working Group, 1998).

The criteria and indicators cover broad topics relevant to sustainable management. They recognize the interdependence of environmental, economic, and social goals. The seven criteria identified by the Montréal Process include vital functions and attributes (biological diversity, productivity, forest health, the carbon cycle, and soil and water protection), socio-economic benefits (timber, recreation, water, forage, and cultural values), and the laws and regulations that constitute the forest policy framework. Within these criteria are 67 indicators (Appendix, A–8) that measure the status and trends of forest conditions and help focus attention on factors affecting sustainability.

## The Montréal Process

The 2003 Assessment uses the Montréal Process indicators but also adapts and expands them to meet the many different conditions within the State. California is a very diverse state with extensive forests, rangelands, metropolitan interfaces, and open space values. Often, the conditions of these components of the forests and rangelands are not expressly considered in the Montréal Process. To address this need, FRAP has used or modified the Montréal Process indicators as well as crafted descriptive, qualitative statements addressing conditions specific to California. These qualitative descriptors are used in cases where FRAP does not have enough information to make a definitive assessment or show established trends.

The broad groupings of Montréal Process indicators, along with list of adapted indicators and descriptors, used by FRAP for the Assessment Summary are shown on the following pages. The list of indicators used by FRAP reflects only a portion of the measurements, indicators, and descriptors documented in the web-based technical reports that more thoroughly cover information on the seven Montréal Process criteria.

## 1 Conservation of biological diversity

**Ecosystem Diversity** (Montréal Process Indicators 1-5)
**Species Diversity** (Montréal Process Indicators 6-7)
**Genetic Diversity** (Montréal Process Indicators 8-9)
**FRAP Adaptation**

- Historical Loss of Forests and Rangelands;
- Parcelization of Forests and Rangelands;
- Area and Distribution of Habitat Types;
- Conifer Forest Structural Characteristics—Size and Density;
- Old Growth Forests;
- Area and Distribution of Hardwoods;
- Management Classification and Distribution of Habitats;
- Population Status of Native Species;
- Status of Endangered, Threatened, and Sensitive Flora and Fauna

## 2 Maintenance of productive capacity of forest ecosystems

**Area of forest land and growing stock** (Montréal Process Indicators 10-12)
**Removal of wood and non-timber forest products** (Montréal Process Indicators 13-14)
**FRAP Adaptation**

- Actual and Potential Growth of Trees on Timberland;
- Forest Land Available for Timber Production;
- Characteristics of Timberland Growing Stock;
- Timber Growth Versus Harvest between 1984 and 1994;
- Rangeland Available for Grazing;
- Rangeland Grazing Capacity Compared to Use

## 3 Maintenance of forest ecosystem health and vitality

**Area of forest land beyond the range of historic variation** (Montréal Process Indicators 15–17)

**FRAP Adaptation**

- Land Management and Resource Outputs;
- Metropolitan Forests and Rangelands;
- Location of Range Livestock Management Activities;
- Impacts from Timber Production;
- Lands in Reserve Status;
- Projected Loss and Alteration of Land Cover Due to Housing Development;
- Projected Loss and Alteration of Hardwood Land Cover Due to Development;
- Wildland Fire Threat;
- Proportion of Forests and Rangelands Susceptible to Ecosystem Health Risk from Wildfire;
- Proportion of Housing Units in the Wildland Urban Interface at Significant Risk from Fire;
- Proportion of Conifer Forest Areas at High Risk to Pest Damage through 2015;
- Identification of Emerging Pests and Diseases;
- Presence or Absence of Range Livestock Diseases;
- Presence of High Impact Non-native Invasive Plants;
- Proportion of Non-native Animal Species Relative to Total Species;
- Presence of Weed Control Programs;
- Trends of Air Pollution Levels Expressed in Non-attainment Days

## 4 Conservation and maintenance of soil and water resources

**Area of forest land with dimished soil quality** (Montréal Process Indicators 18, 19, 21, 22)
**Area of forest land with dimished water quality** (Montréal Process Indicators 20, 23–25)

**FRAP Adaptation**

- Land Use in Watersheds;
- Regulatory Status of Water Quality Impairments;
- Trends in Salmon Populations;
- Monitoring Results of Private Timber Management Practices;
- Monitoring, Watershed Assessment, and Cumulative Watershed Effects

## 5 Maintenance of forest contribution to global carbon cycles

**Total forest ecosystem biomass and carbon budget** (Montréal Process Indicators 26–28)

**FRAP Adaptation**

- Impacts of Climate Change on Forest and Rangeland Resources
- Effects of Forests on Carbon Levels
- Trends in Greenhouse Gas Emission Reduction
- Programs to Reduce Emissions of Greenhouse Gases

## 6 Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

**Production and Consumption** (Montréal Process Indicators 30–34)
**Recreation and Tourism** (Montréal Process Indicators 35–37)
**Investment in the Forest Sector** (Montréal Process Indicators 38–41)
**Cultural, Social, and Spiritual Needs and Values** (Montréal Process Indicators 42–43)
**Employment and Community Needs** (Montréal Process Indicators 44–47)

**FRAP Adaptation**

- Income and Well Being Index;
- Regional Job and Wage Growth Trends;
- Commodity and Non-commodity Production and Use Trends;
- Water Quality and Use, Status of Forest Products Industry, Status of Range Livestock Industry, Status of Forest and Rangeland Energy-Related Resources, and Status of Recreation Industries;
- Timber and Rangeland Contributions to Funding Rural Infrastructure Needs

## 7 Legal, institutional, and economic framework for forest conservation and sustainable management

**Legal Framework** (Montréal Process Indicators 48–52)
**Institutional Framework** (Montréal Process Indicators 53–57)
**Economic Framework** (Montréal Process Indicators 58–59)
**Capacity to Measure and Monitor Changes** (Montréal Process Indicators 60–62)
**Research and Development** (Montréal Process Indicators 63–67)

**FRAP Adaptation**

- Regulatory Jurisdictions Over Management Activities;
- Level of Conflict;
- Level of Cooperation, Information Sharing, and Education;
- Governmental Resource Investments



*Californians* care deeply about the quality of the vast array of forest and rangeland resources. They appreciate their beauty and depend on these natural resources for the basics of life and as part of the State's economy.

In order for Californians to familiarize themselves with the complexities surrounding forests and rangelands, they need to understand the status and trends of the environmental, economic, and social conditions vital to long-term sustainability. This summary of status and trends will help identify regions where California has been most successful in forest and rangeland sustainability and where threats remain.